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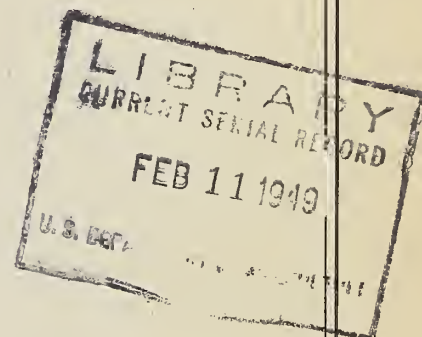
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FORMULA PRICING OF MILK
FOR FLUID USE

By
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and
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FOREWORD

The pricing of milk for fluid use is one of the most complicated problems of marketing which farmers face. Because of the characteristics of milk and the conditions under which it is produced and consumed, pricing of the product is largely a local matter. In most markets prices at the producer level are determined by bargaining negotiations between organized producers of the milkshed and the distributors serving the market.

Out of these bargaining negotiations have developed various complex pricing plans and methods of paying producers for their milk. One of the most important pricing practices that has developed, which is currently of concern to producers, is formula pricing. Formula pricing may be defined as a method of determining prices for a particular period by some agreed-upon mechanism. It eliminates the necessity for constant bargaining between the producer organization and the milk distributors of the market to establish the price level or to bring about price changes. A number of the major fluid milk markets and several secondary markets now operate under Federal milk marketing orders. Formula pricing is especially popular in these markets since it provides a simple and automatic process for bringing about price changes.

This study reviews the conditions which have led to the adoption of formula pricing of fluid milk, the experience with formula pricing in fluid milk markets to date, and attempts to evaluate the advantages and limitations associated with its use. The main purpose of the study is to provide information which may be of assistance to leaders of dairy cooperatives and other interested groups in their consideration of formulas for the pricing of milk for fluid use in their own markets.

FORMULA PRICING OF MILK FOR FLUID USE

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Milk is highly perishable. Consequently fluid milk and cream is customarily produced in the area adjacent to the market in which it is processed and consumed. Each fluid milk market usually has its own health ordinance establishing sanitary requirements designed to assure consumers pure and wholesome supplies. These regulations tend to set certain practical limits to the areas from which a market can draw its supplies in contrast with markets for manufactured dairy products and most other farm commodities.

This local character of fluid milk markets has significant implications. No such thing as a general price for fluid milk exists. Each major market tends to function as an autonomous unit with respect to pricing. Prices in different markets, particularly those adjacent to each other are, of course, interrelated.

The price of fluid milk in a market at any time is the result of the interaction of highly complex factors. No such thing as a physical market place or trading area exists. Prices are established on the basis of negotiations between producers, or their representatives, and milk distributors. More recently, administrative machinery for setting milk prices has been established in a number of markets by either the Federal or State governments.

Public regulation of milk prices had its origin in the breakdown in bargaining between producer-groups and distributors during the depression years of the 1930's. During the first World War, producers of milk for fluid use experienced considerable price difficulties. They were unorganized and distributors were able to resist effectively their efforts to obtain price increases. This worked an acute hardship on producers since it was a time of generally advancing costs of production. Partly because of this experience, the 1920's saw the development of producer cooperatives in most of the major fluid milk markets. Their function was to bargain with distributors over prices and other conditions and terms of milk sales. The distribution of milk in the major markets during this period also became dominated by a relatively few companies. Oftentimes, these companies were affiliated with large dairy corporations forming national chains.

As long as consumer buying power was maintained or expanding, producer organizations and distributors accommodated themselves rather well to the pricing system that developed. The coming of the depression placed a severe strain on producer-distributor relations, however. The pricing mechanisms in operation were, in most instance, unable to withstand this strain. Chaotic marketing conditions developed. Out of these circumstances there developed a general demand, particularly on the part of producers, for some sort of public regulation of fluid milk marketing.

The first activity in the field was by a State government¹ followed closely by the Federal government after the passage of the Agricultural Adjustment Act of 1933.

With improved economic conditions, producer milk bargaining associations again experienced a phenomenal growth. At present dairymen are one of the most highly organized groups in American agriculture. The chief objective of their associations is, of course, to bargain with distributors for the best price and terms of sale they can obtain for their member-producers. In markets operating under State or Federal regulations this bargaining now takes place within the framework of these regulations.

The bargaining between producer groups and distributors has developed numerous complex pricing plans and pricing mechanisms. One of the most common of these is the "use-classification" or "classified price" plan for paying producers for milk. Under this plan, producers are paid different prices for milk produced under the same sanitary requirements, depending upon the use which is made of the milk. The highest price is paid for Class I milk which is that sold by distributors for consumption as fluid milk and cream. The "surplus," milk not needed for fluid use, is paid for at a lower price, usually based upon its value for manufacturing purposes.

Another practice which has come into rather widespread use is that of "formula" pricing. Formula pricing is determining prices for a particular period by some agreed-upon mechanism, thus eliminating the necessity for constant bargaining between the producer organization and the distributors to bring about price changes. These formulas are usually related to a price indicator such as wholesale prices of certain manufactured dairy products, or factors measuring general business activity and consumer buying power.

Formula pricing has become especially popular in markets operating under Federal milk marketing orders, including a number of major cities and several secondary markets. These orders are adopted only after completing a lengthy administrative procedure, including holding public hearings. Formula pricing permits price changes without again going through the cumbersome process of holding a hearing and amending the order.

Experience with formulas has not been uniformly satisfactory. In some Federal markets, dissatisfaction with pricing formulas has led to the use of two or more formulas for pricing Class I milk (fluid use) and to the return, at least temporarily, to specific prices in other markets. During the past year, interest in a number of markets has centered on the problem of devising changes in formulas now in operation to make them more useful and dependable pricing instruments.

¹State Milk and Dairy Legislation. The Marketing Laws Survey, Works Progress Administration. 595 pp. U. S. Govt. Print. Off., 1941.

This report reviews the conditions which have led to formula pricing of milk in city markets. It summarizes the experience with formulas to ascertain some of the advantages and limitations which are associated with their use. Particular attention is devoted to the experience in formula pricing in markets operating under Federal regulation since much of the experience to date with formula pricing has been in these markets. Later sections of the report deal with the problem of devising formulas in markets which either have not used them or where formulas in current use are not entirely satisfactory. The main purpose of the report is to assist leaders of dairy cooperatives and others in their consideration of formulas for pricing milk for fluid use in their own markets.

FEDERAL REGULATION OF FLUID MILK MARKETS

The Federal government first regulated fluid milk prices during World War I. That regulation by the Milk Committee of the Food Administration was an emergency measure with limited objectives and terminated with the war.

Current Federal government activities in regulating fluid milk marketing had their origin in the Agricultural Adjustment Act of 1933. That Act contained a provision empowering the Secretary of Agriculture to enter into marketing agreements and to issue licenses "to processors, associations of producers and others engaged in the handling, in the current of interstate and foreign commerce, of any agricultural commodity or product thereof." Considerable doubt was cast as to the legality of the activities undertaken under this provision by the Supreme Court decision invalidating the Agricultural Adjustment Act. Consequently, the provision authorizing marketing agreements and orders was reenacted and amended by the Agricultural Marketing Agreement Act of 1937. Present Federal milk marketing programs operate under authority of this Act. Essentially, the declared policy of the Marketing Agreement Act is to reestablish prices to farmers at a level which will give agricultural commodities, with respect to articles that farmers buy, a purchasing power equivalent to that of the base period.

The marketing agreement legislation is basically an enabling Act. The Act itself does not apply or impose any regulations on any commodity. It merely authorizes certain regulations to be undertaken to effectuate the declared policies. Two types of regulations are authorized - marketing agreements and marketing orders. Both types apply to handlers of agricultural commodities and not to producers.

A marketing agreement is a contract between the Secretary of Agriculture and the handler of a commodity in interstate commerce. It is entirely voluntary. It has usually been impossible to obtain one hundred percent participation of an industry group on a voluntary basis so it has generally been necessary to issue orders to make the provisions mandatory on all handlers concerned. Orders are the only instrument in use for the Federal regulation of fluid milk marketing at the present time.

It is necessary to hold a public hearing before issuing either a marketing agreement or an order. Orders, in addition, require the approval of two-thirds of the producers affected voting in a referendum.

The Marketing Agreement Act specifies in some detail the regulatory provisions which may be included in an order. It authorizes, for milk, the fixing of minimum prices, the pooling of producer returns, and the requirement that handlers pay producers the minimum prices. Two types of price pooling plans are authorized. One is a marketwide pool under which all producers in a given market receive the same price. The other is dealer or handler pools under which the individual handler is required to pay all producers from whom he receives milk the same price. Under each type of pool, differentials in prices paid producers are permitted for differences in quality of milk and for differences in the location of the producers in relation to the market.

Requests to use the marketing provisions of the Agricultural Adjustment Act of 1933 to control marketing of fluid milk were made immediately. Chicago was the first market in which an agreement was put into operation and by the end of 1933 the total number in effect was 15. These early agreements included provisions establishing minimum resale prices as well as minimum prices to producers. The policy of trying to regulate distributors' resale prices became a controversial issue which culminated in cancelling the agreements on February 1, 1934. They were replaced as rapidly as possible with licenses and agreements regulating only minimum prices to producers. As of April 1, 1948 there were 30 markets operating under Federal milk marketing orders.

ROLE OF COOPERATIVES UNDER FEDERAL MILK REGULATIONS

Federal milk marketing programs did not reduce the need for cooperative associations to protect and advance the interests of dairy farmers. The functions a cooperative perform are, of course, affected by the establishment of Government regulations but cooperatives continue to be of fundamental importance to producers. In connection with Federal milk orders, cooperatives initiate the controls, largely determine their form, represent producers at hearings on prices and all other matters pertaining to the program, and once it is in operation have chief responsibility for devising improvements in the program, including new pricing techniques. Under the Federal marketing programs, public hearings replace collective bargaining negotiations. Representing producers at these hearings however, is, just as important for the cooperative as its previous bargaining function. The decision regarding the level of milk prices is based upon the factual evidence, presented by all interested parties at the hearing, and the producer side of the case rests largely with cooperatives.

Continuous vigor and initiative on the part of cooperatives is important to successfully operate and improve Federal milk marketing programs. The cooperative must be alert in critically appraising and proposing desirable changes in pricing and related provisions. Experience in marketing producers' milk, under changing economic conditions, clearly indicates that constant examination and periodic changes in the pricing mechanism are necessary in most markets. The ability of cooperatives to initiate changes in the programs, as conditions require, largely determines the degree to which the programs are dynamic and useful instruments.

The development of Federal milk marketing regulations was in large part an effort to support the collective bargaining operations of cooperatives and to enable them to regain the ground they had lost during the depression. A general policy under the early market agreement program was that the cooperative in a market was to be supported.² This was partly due to the fact that the Federal program was considered possibly an emergency program and might some day be withdrawn. It was thought essential that existing producer organizations be supported. Otherwise producers would find themselves in a much worse position, than previously, if the Federal program should be withdrawn suddenly.

Support of cooperatives is accomplished in various ways under Federal milk orders. The marketing agreement legislation requires producer approval as a condition for issuing milk marketing orders. Cooperatives, however, are permitted to vote their members as a single unit in any referendum conducted under the program. In practice, this has meant that a hearing, preliminary to issuing a new order, is held only on the proposal of a cooperative and where the same cooperative is prepared to present its producers' case for an order at the hearing.³ Generally a cooperative's proposal for a Federal regulation is based on the pricing, pooling, and other practices already established in the market through collective bargaining with distributors. The general framework of Federal regulation, therefore, is likely to resemble closely the cooperative's own marketing structure, especially in the initial stages of such regulation. The Federal program is often a matter of underwriting the cooperative's marketing structure and extending it to the entire market. It also is a common practice under these orders for cooperatives to receive payments from the pools as compensation for performing such services as check weighing and testing producers' milk. These payments often are the chief means of financial support available to the cooperative.

DEVELOPMENT AND USE OF FORMULA PRICING

ADVANTAGES OF FORMULA PRICING

One of the primary advantages of formula pricing of Class I milk is its flexibility as a pricing mechanism. To the degree that the formula is perfected, it is able to make adjustments automatically in the Class I price in response to changes in the major factors affecting the supply of milk and the demand for milk. It thus helps to avoid the cumulative effects of pricing milk too high or too low over a period of time.

Considerable time is saved by the use of a formula, in making price adjustments, particularly in a market operating under a Federal order. As experience during the last 10 years has demonstrated, it often is

²Economic Standards of Government Price Control. Temporary National Economic Committee Monograph No. 32. 514 pp., illus. U. S. Govt. Print. Off., 1941. p. 69.

³The actual discretion as to whether a hearing should or should not be called, however, is entirely in the hands of the Secretary of Agriculture under Section 8c(3) of the Act of 1937. He can, and in practice sometimes does deny requests of cooperatives for hearings on new orders.

impossible to anticipate economic conditions even for short periods in advance. If it were necessary to hold a hearing and issue an amendment every time the Class I price were changed the administration of a Federal order would be very difficult.

Hearing procedures and collective bargaining negotiation also are likely to be rather costly and it is, therefore, advantageous to reduce their number. A pricing formula settles for a time at least certain basic pricing issues of the market. Until such time as it is considered desirable to re-examine these basic issues, it is unnecessary to hold hearings or bargaining negotiations to consider price changes.

The process of working out a pricing formula is of educational value to all groups in the market. It helps to focus attention on the major factors bearing upon the supply and demand for milk which must be considered in arriving at a satisfactory price. The attempt to derive a workable formula using some or all these factors furthers the general acceptance of pricing principles which may be of permanent benefit in bargaining negotiations or in public hearings. Once agreement is reached, as to the factors which influence price, discussion tends to focus on these factors and extraneous issues are de-emphasized.

FORMULA PRICING OF MILK FOR MANUFACTURING USES

Formula pricing of milk first came into widespread use as a device for pricing surplus milk, or milk used for manufacturing purposes, in markets in which classified price plans were in operation. It has been a practice in such markets to price the milk not needed for Class I or fluid uses on the basis of its value in manufacturing outlets. A formula for automatically accomplishing this objective was adopted early in most markets using a classified price plan.

These formulas were generally based on prices paid for milk by plants making manufactured dairy products or upon the wholesale prices of one or more manufactured dairy products, such as cheese or butter and nonfat dry milk. Both types are used for pricing surplus milk in markets operating under Federal orders. (See table 1.) On April 1, 1948, 23 markets operating under Federal orders based their prices of milk used in manufacturing classes, at least in part, on the prices paid by specified manufacturing plants. (See table 1.) A butter-powder combination was used in formulas in 24 markets and a butter-cheese combination was in use in 12 markets. Other formulas were based on cheese alone, cream-nonfat dry milk, and butter-casein.

FORMULA PRICING OF CLASS I MILK UNDER FEDERAL REGULATION

In some markets, the experimental use of formula pricing of milk for fluid use preceded the development of classified price plans. Milk in these markets was sold on the basis of its butterfat content and prices per pound of butterfat were established on the basis of a premium over current butter quotations.

Table 1. - *Types of formulas in use in markets operating under Federal regulations for pricing milk for surplus (manufacturing) uses - April 1, 1948.*¹

Market	Number of surplus classes	Formulas based on wholesale prices of					
		Prices paid by manufacturing plants	Butter-powder	Cheese	Cream-powder	Butter-cheese	Butter-casein
Boston, Mass.-----	1				x		
Chicago, Ill.-----	3	x	x			x	
Cincinnati, Ohio-----	2	x	x				
Cleveland, Ohio-----	2	x	x			x	
Cinton, Ohio-----	2	x					x
Columbus, Ohio-----	3	x	x				
Dayton-Springfield, Ohio	2	x	x			x	
Dubuque, Iowa-----	2	x		x		x	
Duluth, Minn.-							
Superior, Wis.-----	2		x				
Fall River, Mass.-----					x		
Fort Wayne, Ind.-----	2	x	x			x	
Kansas City, Mo.-----	2	x	x				
La Porte, Ind.-----	3	x	x			x	
Louisville, Fla.-----	2	x	x				
Lowell-Lawrence, Mass.--	1				x		
Minneapolis-St. Paul, Minn.-----	1		x				
Nashville, Tenn.-----	2	x	x			x	
New Orleans, La.-----	2		x				
New York, N. Y.-----	2 ⁴	x	x	x	x		
Omaha, Neb.-Council Bluffs, Iowa-----	2	x	x				
Paducah, Ky.-----	1	x	x				
Philadelphia, Pa.-----	1		x		x		
Quad Cities ³ -----	3	x				x	x
St. Louis, Mo.-----	1	x	x				
Sioux City, Iowa-----	2	x	x				
Suburban Chicago ⁴ -----	3	x	x			x	
Toledo, Ohio-----	2	x	x			x	
Topeka, Kas.-----	2	x	x				
Tri-State ⁵ -----	2	x	x			x	
Wichita, Kas.-----	2	x	x				
Total-----		23	24	2	5	12	2

¹The term "surplus uses" in this table refers to all uses other than Class I. Not all non-Class I uses are surplus, however, over requirements in all markets. For example, fluid cream in many markets must come from the same inspected sources of producer supplies as fluid milk.

²The New York order provides also for several subclasses based upon use and area of disposal. Skim milk uses are priced in a separate class.

³Moline, East Moline, Rock Island, Ill., and Davenport, Iowa.

⁴Includes areas adjacent to Chicago in Illinois and Indiana.

⁵Ashland, Ky; Huntington and Parkersburg, W. Va.; Marietta, Ironton, and Gallipolis, Ohio; and Athens and Scioto Counties, Ohio.

A formula system for pricing Class I milk was adopted in the Chicago market in November 1935, almost 4 years prior to the establishment of the Federal order for that market. The Chicago formula based the Class I price on the minimum price of milk required to be paid by condenseries under a Federal evaporated milk code. Premiums were established over this code price which varied in amount depending on the season. The evaporated milk code price was in turn determined by a formula based on the prices of butter and cheese.

In the first years of Federal milk regulations, prices of Class I milk were "fixed" prices. Prices were established after a public hearing held for the purpose of obtaining information on which to determine prices. The price thus set in a particular market continued unchanged until there was a demand for another hearing and a new price was established. These "fixed" prices could and often did contain some provision for seasonal variations in price.

The procedure for holding a hearing and amending a regulation to establish a new price was relatively simple in the early years of Federal milk marketing programs. Price changes could be accomplished rather quickly. Moreover, since it was not a period of violent price fluctuation or other disturbing economic changes, there was little demand for frequent price changes in most markets. Consequently the "fixed" pricing technique worked fairly well.

The Agricultural Marketing Agreement Act of 1937 established a more rigorous procedure for issuing and amending orders. Under this new procedure, the time required to make changes in Class I prices was greatly increased. Frequently, it is necessary to make such changes promptly. For example, in some markets a change in prices paid by condenseries has almost immediate effects on the supply of milk for fluid use, and shortages or oversupplies can quickly develop unless prices of milk for fluid use are adjusted in line with these changes. Under the new procedure required by the 1937 Act, the effective date of changes in Class I prices was sometimes delayed beyond the most opportune time for the change to have been made.

After 1939 the disturbing economic effects of World War II made it more and more difficult to predict what level of prices should be established for Class I milk. Export demands for manufactured dairy products, such as evaporated milk and cheese, were increasingly heavy following the passage of the Lend-Lease Act in early 1941 and their effects on prices were not easy to predict from month to month. Consequently dissatisfaction arose with respect to the fixed prices under Federal milk orders, and formula pricing was adopted in many markets as a means of making Class I prices more responsive to changes in economic conditions.

The St. Louis, Mo. and Louisville, Ky., markets changed over to a formula pricing basis for Class I milk in 1940, and a number of other markets in 1941. (See table 2.) The trend toward formula pricing under Federal milk orders was interrupted in 1942 by the establishment of price ceilings on milk by the Office of Price Administration. For the

Table 2. - *Dates on which Class I price formulas were first adopted in markets operating under Federal milk marketing orders, April 1, 1948.*

Order number	Market ¹	Effective date of order	Date Class I formula adopted
3-----	St. Louis	2/1/36	12/1/40
4-----	Boston	2/9/36	² 6/1/46
12-----	Dubuque	10/1/36	12/15/41
13-----	Kansas City	12/1/36	5/16/42
27-----	New York	9/1/38	9/1/38
30-----	Toledo	9/16/38	9/21/41
32-----	Fort Wayne	10/15/38	8/8/41
34-----	Lowell-Lawrence	2/12/39	² 9/21/46
35-----	Omaha-Council Bluffs	4/5/39	5/1/46
41-----	Chicago	9/1/39	9/1/39
42-----	New Orleans	10/1/39	2/1/45
44-----	Quad Cities	2/1/40	12/15/41
46-----	Louisville	4/1/40	4/1/40
47-----	Fall River	³ 6/1/40	² 9/21/46
48-----	Sioux City	4/16/40	4/11/43
54-----	Duluth-Superior	5/5/41	5/5/41
61-----	Philadelphia	4/1/42	(4)
65-----	Cincinnati	⁵ 11/23/42	12/1/46
67-----	South Bend-La Porte	⁶ 12/1/47	(5)
68-----	Wichita	6/1/44	12/1/45
69-----	Suburban Chicago	9/1/44	9/1/44
70-----	Clinton	10/1/44	10/1/44
71-----	Dayton-Springfield	7/1/45	7/1/45
72-----	Tri-State	8/1/45	8/1/45
73-----	Minneapolis-St. Paul	11/3/45	11/3/45
74-----	Columbus	2/1/46	2/1/46
75-----	Cleveland	8/1/46	9/1/46
77-----	Paducah	1/1/48	1/1/48
78-----	Nashville	11/16/47	12/1/47
80-----	Topeka	1/1/48	1/1/48

¹For location by States see table 1, page 7.

²Preceded by a fixed price subject to adjustment dependent upon the wholesale price of 92-score butter in New York City.

³Fall River Order (Order No. 47) preceded by Order No. 5, effective July 1, 1936, suspended May 31, 1940.

⁴Prior to October 28, 1941, the Class I price was a fixed price. Subsequent to that date the fixed price has been subject to an adjustment dependent upon the wholesale price of 92-score butter in New York City.

⁵The Cincinnati Order (Order No. 65) was preceded by Order No. 22 which was effective May 1, 1938, suspended Feb. 28, 1942, and later terminated.

⁶The South Bend-La Porte Order (Order No. 37) became effective Dec. 1, 1947. The order resulted from the combination of two previous orders: (1) La Porte (No. 20), effective Nov. 13, 1937; and (2) St. Joseph (No. 67) effective July 1, 1943. Formula pricing of Class I milk under the La Porte Order became effective Dec. 5, 1941 while in the case of the St. Joseph Order formula pricing of Class I milk was provided for in the original order - effective July 1, 1943.

remainder of the war period there were few changes in the pricing structure in fluid milk markets. As a part of the wartime price stabilization policy, direct payments were made to dairy farmers in lieu of price increases when it became necessary to increase dairy farmers' returns in order to maintain milk production. As a result, milk prices were held substantially below the levels which the normal operation of supply and demand in a free market system would have established.

It was obvious that substantial price increases in milk would occur when price ceilings were removed. No one could predict, however, just how much of an increase would occur. The anticipated removal of price ceilings, after the war, thus gave a further impetus to the adoption of formula pricing in Federal milk regulations since under it the Class I price does not have to be determined in advance. During 1945 and 1946, all the remaining Federal order markets, not using formula pricing, changed over to some method of formula pricing (table 2.) Orders for all new markets, which have been brought under Federal regulation since the end of the war, have likewise included provision for determining the price of Class I milk on a formula basis.

Formulas for determining Class I prices under Federal orders vary among the different markets. With one exception, however, those in effect on April 1, 1948, related the price of Class I milk primarily to the value of milk for manufacturing purposes, as represented by the prices paid by specified manufacturing plants, or by wholesale prices of certain dairy products. The exception was the formula for the Boston, Lowell-Lawrence, and Fall River, Mass., markets about which more will be said later.

Most orders included more than one formula with the provision that the one yielding the highest price would be the effective one at all times. Seven orders made use of 1 formula each, 10 had 2 formulas, 12 had 3 formulas, and 1 had 4 formulas (table 3). Of the total of 67 Class I formulas in use on April 1, 1948, there were 23 based on a butter-nonfat dry milk combination, 14 on a combination of butter and cheese prices, 17 on prices paid by a group of Midwestern condenseries, and 9 on prices paid by other groups of manufacturing plants. A new formula went into effect in the three New England markets on April 1, based on indexes of wholesale commodity prices, department store sales, and a feed labor cost index.

The Philadelphia order does not contain a true formula pricing provision but what might be called a modified fixed price provision for determining Class I prices. A specified price with seasonal adjustments is written into the order but provision is made for an adjustment in this price if the price of butter should rise to 82 cents or fall to 67 cents a pound. Provision is thus made for an automatic change in price without going through the amendment process.

EXPERIENCE WITH FORMULA PRICING IN FEDERAL ORDER MARKETS

Experience with Class I pricing formulas has not been uniformly satisfactory. In general, those milksheds in which a substantial quantity

Table 3. - *Method of determining Class I prices in Federal order markets, April 1, 1948, (without regard to temporary suspensions of pricing provisions).*

Market ¹	Total	Fixed price butter adjust- ment	Formulas				
			18 Chicago condens- eries	Other manufac- turing plants	Butter- skim	Butter- cheese	Other ²
Boston-----	1						x
Chicago-----	3		x		x	x	
Cincinnati-----	2			x	x		
Cleveland-----	3		x		x	x	
Clinton-----	2			x		x	
Columbus-----	2		x		x		
Dayton-Springfield----	3		x		x	x	
Dubuque-----	2			x		x	
Duluth-Superior-----	1				x		
Fall River-----	1						x
Fort Wayne-----	3			x	x	x	
Kansas City-----	2		x		x		
Louisville-----	3		x	x	x		
Lowell-Lawrence-----	1						x
Minneapolis-St. Paul---	3		x		x	x	
Nashville-----	3		x		x	x	
New Orleans-----	3		x		x	x	
New York-----	1				x		
Omaha-----	1				x		
Paducah-----	3		x	x	x		
Philadelphia-----	1	x					
Quad Cities-----	2			x		x	
St. Louis-----	2		3x		x		
Sioux City-----	2			x	x		
South Bend-La Porte----	3		x		x	x	
Suburban Chicago-----	3		x		x	x	
Toledo-----	4		x	x	x	x	
Topeka-----	2		x		x		
Tri-State-----	3		x		x	x	
Wichita-----	2		x		x		
Total-----	67	1	17	9	23	14	3

¹For location by States see table 1, page 7.

²Based on indexes of wholesale commodity prices, department store sales, and a feed-labor cost index.

³Plus 5 local plants.

of milk for manufacturing purposes is produced have had the most satisfactory experience with formula pricing. In such markets, the main problem has been to establish proper differentials for prices of Class I milk over the prices paid for milk used in manufactured milk products. These differentials represent mainly the extra costs of transportation charges and of maintaining quality standards and evenness of supply. The Class I price is related directly to prices paid by manufacturing plants or to price quotations for the manufactured products themselves. The Chicago market is typical of the markets in which experience with formula pricing has been most successful. The greatest dissatisfaction with formula pricing has occurred in Northeastern milk markets. The Boston and other New England markets are typical of the areas in which this criticism has been most severe. A brief review of the experience of these markets in formula pricing may aid in giving an insight into the problems involved.

CLASS I PRICING UNDER THE CHICAGO ORDER

The Chicago milk market has a relatively long history of pricing Class I milk on a formula basis. This history goes back to 1935, about 4 years preceding the adoption of the present Federal order in the market. At that time, producers and handlers through negotiation arrived at a formula method of pricing "base" milk. Under the formula, a premium was paid over the price established in the Federal marketing agreement and order for evaporated milk, commonly referred to as the condensery code. The latter was based on price quotations for butter and cheese. "Base" milk was not, strictly speaking, the same as Class I milk under the Federal order. It was a quantity of milk which the producers' association and the distributors considered approximately equal to 120 percent of fluid milk sales. At the time of the public hearing held in June 1939 to consider the adoption of a Federal order, the price of "base" milk was 35 cents over the condensery code price. This milk represented approximately 80 percent of the total output of producers belonging to the association.⁴

The majority of milk distributors were opposed to the adoption of a Federal order. They favored, however, the formula pricing of Class I milk in the event that the Federal order was adopted. They urged that the same formula which had been applied to "base" milk should be used to establish Class I prices under a Federal order.⁵

The Class I formula incorporated in the first Federal order effective September 1, 1939, established premiums for Class I milk over the condensery code price as follows: 70 cents for the months of July through November; 55 cents for the months of December through April; and 45 cents for the months of May and June. The changes in the amounts of the premiums were calculated to provide an incentive to the more even production of milk which, prior to the order, had been provided by a base-surplus plan of payment. This formula was continued in effect

⁴Page 47 of record of public hearing for Order 41 held in Chicago, June 1939 on file in the Office of Solicitor, United States Dept. of Agriculture.

⁵Page 13 of brief of Associated Milk Dealers Inc., submitted in connection with the June 1939 hearing.

during the next two years. The only change made during this period was in the pricing of Class I milk sold in connection with relief milk programs which, because of the special nature of the use, is not dealt with here.

Effective September 6, 1941, a butter-cheese factor was introduced into the Chicago order as an alternative method of pricing Class I milk and the condensery price was changed from the code price to actual prices paid by 18 Midwestern condenseries. The formula on which the Class I price was based was made the higher of: (1) The butter-cheese formula established in the condensery code or (2) the average paying prices of 18 specified Midwestern evaporated milk plants. A premium of 70 cents over the basic formula was established for all months, except May and June, when the premium was reduced to 50 cents.

Cheese prices increased substantially in 1941 in response to lend-lease demand. The inclusion of cheese prices in the Chicago formula was prompted by this situation. The decision to introduce the actual paying prices of evaporated milk plants was based upon testimony at the hearing that premiums of as much as 30 cents over the condensery code price were being paid by evaporated milk plants.

The formula adopted September 6, 1941, was in operation a little more than a year when a third element was introduced into the pricing mechanism. The demand for lend-lease products began to shift from evaporated milk to nonfat dry milk. In April 1942 and subsequent months, the Chicago Class IV price, based upon the prices of butter and nonfat dry milk, exceeded the average of prices paid by the 18 evaporated milk plants specified in the order. Plants manufacturing butter and nonfat dry milk are located in many parts of the Chicago milkshed and there was danger that these plants would draw off part of the Chicago fluid milk supply.

In keeping with its past policy of trying to maintain the price of Class I milk in line with competitive prices paid by manufacturing plants, the producers' association successfully petitioned for an amendment to the order to include quotations for butter and nonfat dry milk as an alternative method on which to base Class I prices.

The premium over the basic formula price continued to be 70 cents for all months except May and June when it was reduced to 50 cents. In order to encourage a high total output of milk during the war period, however, the lower premium for May and June was suspended during 1943, 1944, 1945, and 1946.

Only minor amendments to the method of pricing Class I milk under the Chicago order have been made since 1942. These amendments have been concerned with such matters as yield and cost factors for manufactured dairy products on which the Class I price is based, appropriate price quotations, and seasonal differentials.

At present, there appears to be very little interest in any fundamental change in the Class I pricing formula among representatives of either producers or distributors in the Chicago market. The sharp fluctuations in butter and nonfat dry milk prices, following price decontrol, did not adversely affect Chicago Class I prices, since the prices paid by the condensery, which have been more stable, have been the controlling factor in the formula most of the time (table 4). Only once, from November to December 1946, has the formula resulted in a contra-seasonal movement in Class I prices. No suspensions of the formula have been made since price decontrol in July 1946. There is general agreement among the various segments of the industry that Class I prices must be maintained in close relationship to the prices of evaporated milk and other manufactured milk products. Indications are that future pricing discussions will be largely confined to such matters as seasonal differentials and manufacturing allowances in the present formulas and that little consideration will be given to new types of formula.⁶

⁶The pricing of out-of-area sales of Class I milk and the adjustment of location differentials are current subjects of serious discussion which are not dealt with in this report.

Table 4. - *Basic Price Governing Class I Price - Chicago Order No. 41.*

Month	Amount	Identification
1946 July-----	3.621	18 condensery pay price July 1946
August-----	3.733	18 condensery pay price August 1946
September-----	4.203	18 condensery pay price September 1946
October-----	4.400	18 condensery pay price October 1946
November-----	4.546	18 condensery pay price November 1946
December-----	4.303	18 condensery pay price December 1946
1947 January-----	3.867	18 condensery pay price January 1947
February-----	3.554	18 condensery pay price February 1947
March-----	3.521	18 condensery pay price March 1947
April-----	3.878	18 condensery pay price April 1947
May-----	3.019	18 condensery pay price May 1947
June-----	2.975	18 condensery pay price June 1947
July-----	3.156	Butter-powder price July 1947
August-----	3.454	Butter-cheese formula price August 1947
September-----	3.454	Butter-cheese formula price August 1947
October-----	3.663	Butter-powder price September 1947
November-----	3.625	18 condensery pay price October 1947
December-----	3.625	18 condensery pay price October 1947
1948 January-----	4.262	Butter-powder price December 1947
February-----	4.817	18 condensery pay price January 1948
March-----	4.185	18 condensery pay price February 1948
April-----	4.007	18 condensery pay price March 1948
May-----	4.058	18 condensery pay price April 1948
June-----	4.128	18 condensery pay price May 1948

Note: The butter-powder price of \$3.845 in November 1947 was the highest of the alternative formulas for that delivery period, but was not used to govern Class I price.

CLASS I PRICING UNDER THE BOSTON ORDER

The Boston milk market has had a relatively short experience with formula pricing of Class I milk. A "butter-powder" type of formula was adopted June 1, 1946. For many years prior to 1946, Class I prices under the Federal order for the Boston market were specified prices subject only to adjustments within a narrow range for changes in butter prices. The Class I pricing formula in effect prior to April 1, 1948, is summarized as follows:

The Class I price, for milk of 3.7 percent butterfat, f.o.b. the 201-210 mile zone, is related to the value computed pursuant to the following formula: Price per pound of New York 92-score butter, plus 1.8 times the average price per pound of nonfat dry milk solids (carlots, roller process, human consumption and animal feed), minus 7.2 cents. When the value computed by this formula is at least 60 cents but less than 65 cents, the April-June Class I price is \$3.45 and the July-March Class I price is \$3.89. For each 5-cent change in the formula value, the Class I price changes by 22 cents.⁷

The butter-powder formula in the Boston order was, from the start, a subject of controversy. Initially, the formula was criticized for not yielding a price sufficiently high following price decontrol. During the first month following its adoption, the formula provision in the order was suspended (table 5). The year and a half the butter powder formula was part of the Boston order was one of highly unsettled price conditions with butter prices particularly subject to wide fluctuations. As a result, adherence to the formula would have yielded undesirable and illogical price movements on many occasions. Consequently during most of the time the formula was part of the order from June 1946 to April 1, 1948, it was rendered inoperative by suspension action or by contra-seasonal provisions of the order (table 5). From the start the formula was criticized by certain producer groups in the market and, with the subsequent experience of the market, it fell steadily into disrepute among all segments of the industry.

In April 1947 the Milk Market Administrator for the Boston marketing area appointed a committee to explore the possibilities of devising a more workable formula for pricing Class I milk. The committee was made up of eight New England economists from cooperatives, distributors, and universities. After several months of study, this committee devised a new formula, provisions of which are summarized as follows:

- 1 - An index of U. S. wholesale commodity prices published by the Department of Labor is revised to a 1925-29 base.
- 2 - An index of New England department store sales reported by the Federal Reserve Bank of Boston is revised to a 1925-29 base.
- 3 - An index of feed and labor costs in the Boston milkshed is prepared on a 1925-29 base.

⁷Summaries of Fluid Milk Marketing Orders, April 1, 1947. 110 pp. Issued by Dairy Branch, Production and Marketing Administration, U. S. Dept. Agr. See p. 4.

Table 5. - Boston minimum Class I prices effective under Order No. 4 and prices resulting from butter-powder formula computation for 3.7 percent milk at 201-210 mile zone, July 1946 - August 1948.

	Minimum Class I Price	Butter-powder formula ¹	Difference	Method by which minimum price was established
(Dollars per hundredweight)				
1946 July-----	\$4.09	\$4.09	\$ 0	Suspension
August-----	4.09	4.49	-.40	Suspension
September--	5.21	4.99	.22	Sept. 21, amend- ment floor
October----	5.21	5.21	0	Butter-powder formula
November---	5.65	5.65	0	Butter-powder formula
December---	5.65	5.43	.22	Floor
1947 January----	5.65	5.65	0	Butter-powder formula
February---	5.21	4.77	.44	Floor
March-----	4.77	4.55	.22	Suspension
April-----	4.77	4.11	.66	Suspension
May-----	4.33	3.89	.44	Suspension
June-----	4.33	3.67	.66	Suspension
July-----	4.77	4.33	.44	Suspension
August-----	5.21	4.33	.88	Suspension
September--	5.21	4.77	.44	Amendment floor
October----	5.65	5.21	.44	Suspension
November---	5.65	4.77	.88	Contra-seasonal provision
December---	5.65	5.21	.44	Contra-seasonal provision
1948 January----	5.65	5.65	0	Suspension
February---	5.65	5.65	0	Suspension
March-----	5.65	5.65	0	Suspension
April-----	5.43			Index formula
May-----	5.43			Index formula
June-----	5.43			Index formula
July-----	5.65			Index formula
August-----	5.87			Index formula

¹Butter-powder formula (N. Y. 92-score butter plus average price roller powder, animal and human times 1.8) was a provision of Order No. 4 June 1946-March 1948 except during periods noted by suspension. The schedule of Class I prices related to the butter-powder factor was revised September 21, 1948.

4 - These indexes are averaged and a schedule of Class I prices is established to correspond with ranges of this average. Thus when the average of the indexes falls in the 160-166 range, the Class I price (April-June) would be \$4.77 per hundredweight. The Class I price moves up or down by 22 cents whenever the average of the indexes falls into another 7-point range class.

5 - Seasonal adjustments are provided. The lowest Class I prices are in the months of April, May, and June. An additional 44 cents is paid during January, February, March, July, August, and September. A further addition of 44 cents is paid in October, November, and December.

6 - If supplies of milk have been abnormally high or low, 44 cents is added or deducted from the Class I price.

7 - Special provision is made to prevent contra-seasonal price changes. That is, the Class I price may not fall during months of September through December and may not rise during months of March through June.

This formula, with slight modification, was adopted on April 1 for the Boston, Fall River, and Lowell-Lawrence markets.⁸ It represents a rather new approach to the problem of formula pricing of milk for fluid use in city markets. It abandons the trend of past years to tie Class I prices directly to prices of manufactured milk products. Instead, it relates the Class I price to indexes representing general economic conditions, regional production costs, and consumer purchasing power. The following excerpts paraphrased from the record of the public hearing held October 20-24, 1947, indicate what is expected of this formula by its proponents:

The formula is rational. It recognizes economic conditions in general, through the index of wholesale prices. It recognizes conditions in our region, with particular reference to demand or ability of consumers to buy. It recognizes the problems of producers in the milkshed, with particular emphasis on two major items of production costs. The formula provides a safeguard against milk shortages and against a burdensome surplus. It also recognizes the need for encouraging more even seasonal production. (Page 229.)

The primary object of this formula is to establish a stable milk market situation in the Boston milkshed - a situation in which enough milk is produced but not too much. Given this kind of price setting, milk producers will know in advance what they can count on in the way of prices. That means a high order of security for them, an order of security which they have never enjoyed in the past. (Pages 269-270.)

Any formula to be successful has got to gain the confidence of the farmers who live under it. It has, at least, got to be

⁸Provision in the formula for adjustment of prices based on supply and demand relationships will not operate until January 1, 1949.

something that they tolerate and respect, whether they are enthusiastic for it or not. The butter-powder formula never had the confidence of dairy farmers. Here, at least, is a scheme that could get started on the right foot. (Pages 94-95.)

As handlers we have been particularly interested in the fact that the primary objective which the Committee recognized was the maintenance of an adequate supply of milk. We believe that the type of formula proposed is sound and will operate in the best interests of producers, consumers, and the industry as a whole. It contains sufficient safeguards to avoid letting market conditions get out of hand. It should have a good fair trial. (Pages 188-192.)

SUMMARY

Until recently formulas for determining the price of Class I milk were concerned with maintaining some fixed relationship between the price of Class I milk and the value of milk for manufacturing purposes. In fluid milksheds, adjacent to or including areas in which production of milk for manufacturing outlets is large, the results achieved by formula pricing have been viewed as generally satisfactory.

Even in these markets, it has been necessary to make changes in the formulas used from time to time. Typically, markets which first adopted formulas, relating fluid milk prices only to one manufactured dairy product, have found it necessary to expand their formulas to include one or more alternative pricing methods. In a few instances as many as four alternative methods of pricing are provided. In every instance of multiple formulas, the one yielding the highest price is the prevailing one at any given time.

Changes in the general level of prices have made it necessary to review from time to time the differentials over the basic formula price used in establishing Class I prices. In every market with any extended experience with formula pricing, periodic changes have been made in these differentials. Changes in the differentials also have been made in many markets to introduce a greater measure of seasonality in pricing Class I milk.

In the milksheds of the Northeast, where the competition for available milk supplies between fluid milk uses and manufacturing outlets is less direct, experience with formula pricing has been less satisfactory. Considerable sentiment has developed against formulas which result in every random fluctuation in prices of manufactured dairy products being reflected in returns to producers supplying milk needs.

Much of this criticism would appear to be justified. Insufficient attention has probably been given to date to the varying degree in different markets to which returns in manufacturing outlets provide an adequate basis for which to price Class I milk. In markets where supplies cannot easily shift back and forth from fluid to manufacturing

outlets, returns from manufacturing uses may not adequately reflect the economic factors which should be considered in pricing milk for fluid use. Tying Class I prices solely to prices for manufactured dairy products in such cases gives inadequate consideration to local supply and demand conditions in setting the level of prices.

The difficulties inherent in pricing formulas which seek to maintain a constant relationship between Class I prices and the prices of manufactured dairy products are well illustrated under conditions where the latter are affected by more or less special causes. During the winter of 1946 and the spring of 1947 prices of manufactured dairy products experienced a rather sharp decline. This occurred during a period when prices in general and milk production costs were increasing.

A certain degree of shifting of supplies from manufacturing uses to market milk uses would have been desirable, especially in view of the fact that most fluid markets were short of milk at the time. In any case there was apparently little reason for Class I prices wholly reflecting the erratic fluctuations that were taking place in the prices of manufactured milk products.

There has been some loss of confidence in pricing formulas which relate fluid milk prices directly to quotations for butter or cheese due to a belief that these quotations may not be completely competitive and under certain conditions may be subject to some control or manipulation. Some evidence to support this view has been supplied by investigations of the cheese exchange where a few transactions may establish the official price and premiums are often paid on transactions outside the exchange. Also, experience in the New York milk market has shown at least the possibility of a moderate amount of buying or selling affecting the butter quotation for a period of several days.

The present method of establishing butter price quotations has been extensively criticized. The following quotation from an important dairy trade journal is typical:⁹

"Within the seven-day period which ended last Friday, New York Extras had gone from 80 cents to as high as 84¢ on an outside quotation, and back to 78¢ again. Meanwhile Chicago Extras had gone from the same starting point 80¢ to a high of 81½¢ and to a low of 76¢.

"Check over the history of the butter picture for some time and it will be discovered that last week's fluctuations were more typical than exceptional.

"Is there any sense in a situation of that kind?...

"It seems inconceivable that the gigantic dairy industry should permit its values to be established on no more sound a basis than that some dealer who has managed to acquire a quantity of butter should be able to advance his selling price through the

⁹Dairy Record. Saint Paul. Minn. Feb. 25, 1948.

simple expedient of bidding an extra cent or two on an Exchange, knowing that the markets are so thin that he will not have to take any material quantity when he bids up the price--or, conversely, he will not have to sell much if he wants to depress the market for any selfish purpose."

Dissatisfaction with formulas in use in Northeastern markets has been manifested by repeated suspensions of these formulas. Such suspensions make it difficult to reinstate the formulas as they were with any hope that producers, distributors, and consumers will have confidence in their future ability to reflect proper adjustments in prices. In some cases, floor prices have been written into the Federal orders to supersede formula prices when the latter fall below the floor level. The use of this device also tends to weaken confidence in the workings of the formulas.

There has been some further criticism of existing formulas for pricing Class I milk from the standpoint of their lack of coordination. In markets whose supply areas overlap it has been felt by some that insufficient attention has been given to the problem of maintaining a proper relationship between prices at all times.

Criticism of existing formula pricing has culminated in an entirely new formula, divorcing fluid milk prices directly from manufacturing milk prices, being adopted in the Boston and other New England milk markets operating under Federal order. Other areas are showing a similar interest in revising their present method of formula pricing. New York, Philadelphia, and several Ohio markets all initiated studies in early 1948 directed toward this end.

CONSIDERATIONS IN DEVISING PRICING FORMULAS

LIMITATIONS OF FORMULA PRICING

Any group working on a formula for automatically pricing fluid milk should fully understand the limitations of formula pricing. In the process of developing pricing formulas for Class I milk, some misconceptions have arisen as to what such formulas can accomplish.

A most serious misconception of some people is that the adoption of a formula can settle price issues in the market for all time, or at least for an indefinite period. Their attitude appears to be that a certain fixed and permanent relationship exists among the factors affecting the price of milk in a market. They believe that once this relationship is discovered and incorporated into a pricing formula, the price issue is settled; there is scarcely a need to discuss prices, and no possible basis for serious controversy over prices can exist. Of course, few people would express such an extreme view, but many have tended to look to the adoption of formulas as a means of ending all differences over prices for a long period of time.

Several reasons can be given why a formula should not be looked upon as a final settlement of Class I price issues in a market. In the first place, no formula could incorporate all the elements bearing upon supply and demand relationships in the market. Even the best formula will oversimplify the situation by incorporating at most only a few of the major factors bearing on the price. The addition of numerous minor elements entering into the price picture would make formulas unwieldy and confusing.

While only a few of the major factors bearing on price determination are used, it is not possible to arrive at a formula which is a perfect expression of their precise relationship. The formula at best can approximate this relationship. A slight error, or bias, in the formula may be of little significance at first but over a period of time might become serious unless some adjustment is introduced.

There is always a danger that groups in a market, in their sincere enthusiasm for a formula, may tend to place complete and uncritical reliance upon it. The formula is then looked upon as an "automatic pilot" for pricing. No formula can be perfect and the success of the best formula requires continuous appraisal of its workability on the basis of actual conditions in the market. One of the factors in the success of any formula is the understanding of, and confidence in, its operation by all groups interested. Such understanding and confidence is increased by repeated review and reports on how the formula is operating.

Continuous appraisal of the operation of a formula also is required because of the fact that the relationship of even major pricing factors is not static. When the formula is adopted, an attempt is made to express certain relationships as they exist at the time. With the passage of time, however, the actual relationship may change so that the formula must be modified to take these changes into account. For example, a formula may establish the price of fluid milk at a premium over prices paid by manufacturing plants. Part or all of this premium may be calculated to take account of differences in the quality of milk. Such differences may change, however, due to new health requirements or new enforcement policies in the city, or to changes in the requirements for quality milk of manufacturing plants.

A further misconception about formula pricing may arise through a tacit assumption that the formula is a kind of long range contract. The adoption of a formula for Class I milk pricing does not necessarily imply an agreement by all parties to abide by the formula for any period beyond, perhaps, a relatively short trial period. It is more in keeping with a proper understanding of the limitations of formula pricing if, after a trial period, all parties are free to propose changes at any time without such proposals being considered in any way a breach of faith.

Any proposal for altering the formula should be considered on its merits as to whether it is likely to substantially improve its workability. A

certain presumption in favor of leaving the formula as it is, however, may be desirable so long as a close and continuous check is maintained on its operation. This presumption is based on the advantage of not making frequent or unnecessary changes which reduce understanding of the formula and confidence in the validity of the prices resulting from its operation.

In a Federal market, the adoption of a price formula does not do away with the necessity for holding hearings on prices.¹⁰ It should, of course, reduce the frequency of price hearings once it is in satisfactory operation. This is one of the purposes and advantages of a pricing formula. The short time price adjustments which previously required hearings and order amendments are taken care of by the operation of the formula. Hearings on prices are still required to determine how well the formula is working and to provide full opportunity for exploring the value of suggested changes. It may be desirable, even where a Class I formula is operating with apparent satisfaction, to hold a hearing at least once each year to fully review and appraise its operation.

A pricing formula, no matter how good it is, cannot guarantee stability of marketing conditions. The best that can be done, in a given market under any method of pricing, is to mitigate the effect of economic forces which tend to disrupt marketing operations. It cannot be expected to protect the market from the effects of broad economic disturbances associated with the business cycle. Those who look to formula pricing as a solution to farmers' problems in periods of economic crisis or depression are expecting too much from a pricing device. A market which has had a history of satisfactory prices would, however, be in a better position to face adverse economic conditions than one in which a history of unsatisfactory prices had already created unstable marketing conditions, such as abnormally high seasonal or year-round surpluses.

RELATION TO ECONOMIC CONDITIONS

A formula, to have any chance of successful operation, must be based upon the special economic conditions of the region and market in which it is to apply. An analysis of these conditions is, therefore, a prerequisite to devising a formula. This analysis should be directed to such matters as: (1) The degree to which the region is characterized by a surplus or deficit of milk in relation to consumption of all dairy products, (2) kinds and amounts of milk products manufactured, (3) proximity of manufacturing plants to the supply area, (4) proximity of other sources of milk which can be drawn upon for fluid consumption, (5) type of health regulations and enforcement policies in the market, (6) types of farming and competitive farm enterprises, and (7) influences bearing upon employment and payrolls in the market.

¹⁰The opposition to the adoption of a new Class I pricing formula in Boston and other New England markets, at hearings in October 1947, stated that it would do away with hearings on prices. It was further contended that in doing away with price hearings, it would violate the requirements of the Agricultural Agreement Act of 1937 under which the order was issued. The proponents of the formula pointed out that the need for price hearings would not be eliminated by its adoption.

This is by no means a complete list of points to be included but is intended to give some idea of the scope of the analysis which should precede any attempt to devise a pricing formula for fluid milk. The analysis should give as complete an understanding as possible regarding the factors affecting the supply and demand for milk in the market and the inter-relationship of these factors.

SELECTION OF INDEXES AND QUOTATIONS

In developing a pricing formula, considerable care should be exercised in the selection of the particular indexes and price quotations to be used. The series selected should be as reliable and representative as possible and one which is likely to be continuously available.

Indexes or price quotations which are generally considered standard or official in the trade are to be preferred to those which are prepared and disseminated for private or restricted use. Consideration should be given to the type of agency which prepares or releases the data. If it is not a part of the Government, its nature should be examined to determine the degree to which it is independent of influence by outside sources.

If an average of price quotations by specified plants is to be used, care should be used in selecting the plants. This should be done so as to minimize the possibility that either singly or collectively they would have an incentive for manipulating their price quotations because these quotations were to be used in pricing fluid milk. This can be done by selecting plants whose owners do not have interests in the distribution of fluid milk and by using a sufficient number of plants so that the transactions of one will not unduly affect the average. Consideration also should be given to payment practices for milk, particularly those relating to premiums for such factors as quality and location. One of the reasons given for a change in the Class I formula in the St. Louis market (September 1, 1947) was that the prices reported by the evaporated milk plants, specified in the formula, did not include premiums some of these plants were paying producers on the basis of quality and volume.

Care should be taken to make sure that an index selected is most representative of the factor desired for inclusion in the formula. For example, many different indexes might be available each of which might to a certain degree reflect changes in consumer purchasing power in the market. There might be general and special indexes of payrolls and employment. Other indexes might show buying volume or department store sales, food sales, and other types of sales. The index selected should be one which would be expected to reflect changes in the desired factor, in this case consumer purchasing power, and be properly sensitive to indicate the approximate degree of such changes.

Prior to the selection of any index or quotation for use in a pricing formula, full information should be obtained as to the way in which it is derived or computed. In the case of an index, this includes the

actual data used in its construction, a summary of how the data are obtained, and the statistical processes used in arriving at the final index number. If a price quotation is to be used, it should be known how individual prices are reported and, if the quotation is on a commodity exchange, something should be known as to how transactions on the exchange are conducted so as to assure the validity of the quotations announced.

The probable continuity of an index or quotation also must be considered. An index which may be available for part of the year, or which is likely to be discontinued, may better be replaced by one which may be less desirable in other respects but which is more certain to be always available. In some formulas now in use under Federal orders, provision is made for substituting an alternative price quotation for one which may not always be available. The length of time that an index or quotation has been issued and the nature of the agency through which it is released should give some indication of its likely continuation. Prior issuance of the index or quotation also permits analysis of how the pricing formula would have operated in past years. This is of considerable value in testing a formula.

In designating a price quotation to be used in a formula, care must be taken in naming the quotation precisely so as to remove any possible confusion as to which one is intended to be used. Quotations for dry skim milk, for example, may differ with shipping points, whether roller or spray process, for human consumption or animal feed, whether in bags or barrels, and in carlot or smaller quantities. Prices paid for milk by manufacturing plants may be gross prices or may be net prices after deducting hauling charges and service charges of one kind or another.

In using indexes in a pricing formula, a problem arises of selecting a base period or periods. Here, an empirical approach is probably best. Some trial and error in plotting the indexes on various bases will help to determine which base period will be most satisfactory. A general rule for guidance is to select a base from part of some relatively stable and fairly recent period. The approach of the Boston Milkshed Price Committee to this problem is indicated by the following quotation from its report:¹¹

"Analyses were made with the various factors on common bases of 1936-1940, 1938-1941, and 1925-1929. It was clear from studying the results of these analyses that the 1925-1929 period furnishes the soundest base period. Farm prices in the United States were close to parity during this period. Milk prices were rather stable during these 5 years, with the Boston Class I price, f.o.b. 200-mile zone, averaging \$3.19 a 100 pounds. All of the key factors also were on a fairly even keel during this 5-year period, and, with 1925-1929 as a base, they lined up with each other rather well in more recent periods. Conditions were not so uniformly stable during either

¹¹A Recommended Basis of Pricing Class I Milk in the Boston Market. A report by the Boston Milkshed Price Committee, 108 pp., illus. September 1947. See page 40.

of the more recent base periods that were analyzed. Effects of heavy unemployment and later the war marked these periods as abnormal."

TYPES OF FORMULAS

The economic analysis of the market will bring out an array of factors influencing the Class I price. It also may indicate certain relationships between the Class I price in the market and other prices. Any factors bearing upon or historically related to the Class I price in the market may be considered for inclusion in the formula. The variety of possible formulas which might be devised in a given market is very great.

The Class I formulas adopted in Federal order markets, prior to the introduction of the new Boston formula, were of the correlation type. No attempt was made to isolate and incorporate into these formulas the economic factors bearing on prices of fluid milk. Instead, the formulas were based upon the assumption that close and fairly constant relationships exist between fluid milk and manufactured milk products on an annual basis. The formulas attempted to maintain what appeared to be a normal relationship between Class I prices and prices of one or more dairy products (or with prices paid by selected manufacturing plants) on the basis of analyses of past relationships and knowledge of differences in costs of producing milk for different uses.

There are, of course, causal relationships between changes in manufactured milk prices and fluid milk prices. Taking fluid milk markets in the aggregate, however, important changes in the supply or demand for milk for fluid use are just as likely to affect prices of manufactured milk products as the other way around.

The formula adopted in the Boston and other New England markets differs from other formulas in that it abandons the attempt to correlate the Class I price to manufactured milk prices. Instead, it relates the Class I price to what are considered to be several of the major influences which might affect the price. The committee which proposed the formula did not try to include all of the factors affecting the Class I price. Its approach to the problem is explained in its own report as follows:¹²

"The results of these studies pointed the way to the detailed statistical analyses which formed the basis for the final conclusions and recommendations. These analyses involved measuring and appraising changes in a number of factors relating to milk prices and milk supply and demand conditions in the Boston market on an annual as well as on a seasonal basis. The principal factors included were (1) United States general wholesale price index; (2) United States wholesale food price index; (3) consumers' price index for Boston; (4) department store sales index for New England; (5) Chicago wholesale butter prices; (6) calculated total cost of milk production; and (7) cost of grain feed and farm labor."

¹²A Recommended Basis of Pricing Class I Milk in the Boston Market. A report by the Boston Milkshed Price Committee. 108 pp., illus. September 1947. Page 1 ff.

"Investigation of the above factors disclosed that it should be possible to price Class I milk in Boston on a sound basis by maintaining a fairly constant relationship between the Class I price and the composite level of United States wholesale prices, New England department store sales, and Boston milkshed grain-labor costs. This seemed particularly feasible, even though it was realized that the pricing relationship might need modification from time to time as indicated by experience, when it appeared that the Class I price could be made subject to automatic realignment whenever the longer-term trends in market receipts and fluid milk sales get out of reasonable balance."

It also is possible to devise formulas which would combine the correlation-type and the Boston-type formulas. For example, a formula might be devised establishing a Class I price based on a differential over butter and nonfat dry milk quotations. The differential itself could vary with indexes representing feed and labor costs in the supply area, consumer buying power in the market, or some combination of these.

APPROACH TO DEVELOPING A FORMULA

As already indicated, it is not possible to devise a perfect formula in the sense of one which would take account of all factors which affect the marketing of fluid milk and influence the Class I price. The problem of devising a pricing formula is not one of discovering ultimate truths about price relationships. Rather it is the practical problem of setting down, on the basis of analysis of marketing conditions, some logical procedure for making automatic adjustments in the Class I price to keep it approximately in line with changes in these conditions as they occur. The procedure for price adjustments as embodied in the formula should be fairly simple, at least in comparison to the real complexities of economic factors at work, if it is to be understood and if the computation of prices is not to become too involved.

The nature of the problem calls for an approach which is to some extent experimental. A number of different logical relationships may be tried and tested on the basis of how they would have worked over a past period. The Boston Committee made a considerable number of such tests. Experiments also may be carried out with hypothetical future situations to test the extent of price changes which would take place under varying conditions.

Once a formula is put into use, it is of course tested in operation under actual conditions. An initial period may be looked upon by producers, distributors, and consumers as a trial period during which the operation of the new formula should be subjected to close observation with a view to recommending any changes which may appear necessary to correct weaknesses in the formula.

DEVICES FOR FLEXIBILITY

Two special devices may be mentioned which warrant consideration from the standpoint of adding to the flexibility of a Class I pricing formula and making it adaptable to special conditions in the market. One of these is some kind of seasonal adjustment to encourage more even supplies the year around. One of the special problems of marketing fluid milk is that of reducing the amount of the normal seasonal surplus in order to bring supplies into closer relation to consumer needs. A number of different types of plans have been devised for this purpose, some of which, such as base-rating, may operate independently of the particular method of pricing used.

Most pricing formulas would tend to bring about some seasonal changes in pricing. It is, however, possible to accentuate these changes by special provision in the formula for seasonal differentials. Under the Chicago order, for example, the following schedule of differentials is applied to the basic formula price: 90 cents more a hundredweight for the months of August through November, 70 cents for the months of December through April, and 50 cents for May and June. These differentials, combined with the seasonality of the basic formula and a normally greater utilization of Class I milk during the fall and winter months, provide the incentive to dairy farmers to even out their production of milk.

Some kind of adjustment based on Class I sales in relation to total supplies also merits consideration, particularly in markets where the influence of local conditions is apt to be more important than broader market relationships. One test of the adequacy of prices is whether large surpluses and shortages are avoided. An automatic adjustment in the Class I price, downward when surpluses tend to become too large and upward when the supply tends to become too small, may add to the flexibility of a formula and help it to meet special requirements of the market. A severe local drought might reflect itself more quickly in reduced supplies than in changes in factors embodied in a formula. A supply-demand adjustment would provide a quick change in the Class I price to help producers maintain production during and after the drought period.

Another device deserving of consideration is one which prevents contra-seasonal movements in prices. Actually such a device might be said to reduce flexibility but its real purpose is to prevent intended seasonal differentials from being negated by contra-seasonal movements in the basic formula price. For example, milk prices normally increase, or at least do not decrease from August through December. A more desirable seasonal pattern of prices might be created by establishing as the "floor" price the highest price which the formula yielded during this period in order to prevent a possible contra-seasonal decline.

Similarly, no increase should be permitted during the spring months when prices are normally declining. The amendment to the Boston order adopted April 1, 1948, contains safeguards of this nature as follows:

"Notwithstanding the provision of the preceding subparagraphs of this paragraph, the Class I price for any of the months of March through June of each year shall not be higher than the Class I price for the immediately preceding month, and the Class I price for any of the months of September through December of each year shall not be lower than the Class I price for the immediately preceding month."

CLASS I FORMULAS WITH BRACKETED PRICES

Class I price formulas may provide for changes as small as one cent per hundredweight or they may "bracket" such changes so as to provide for changes to correspond with resale price changes of one cent, one-half cent, or one-quarter cent per quart. On May 1, 1948, bracket Class I prices were in effect only in markets of the Northeast. New York and New England markets had Class I formulas providing for changes of 22 cents per hundredweight at one time. Philadelphia, with a fixed Class I price, provided for a 40 cent adjustment up or down depending upon changes in the price of butter.

Supportors of bracket-type Class I formulas argue that it is advantageous for changes in producer prices to occur simultaneously with changes in prices to consumers. It is difficult to make changes in consumer prices in units of less than one-half cent a quart. In some cities, consumers are said not to be accustomed to resale price changes of less than a full cent a quart. If prices to producers are changed by smaller amounts, distributors must decrease or increase their margins. The result of varying decisions of each distributor and the sporadic nature of price changes may, it is said, cause some instability in the market which ultimately may adversely affect producers and consumers.

Criticism of the bracket-type Class I formulas is expressed on the grounds that in Federal order markets, at least, it may give an appearance of official sanction to margins of distributors. It may oversimplify the price situation, making it appear to the consuming public that changes in producer prices are the only factors affecting resale prices.

The bracket-type Class I formula also may cause dissatisfaction among producers when the formula just misses giving them the next higher price. It also may encourage groups in the market to try to exert some measure of influence on the quotations or indexes used in the formula. This might occur, for example, near the end of a pricing period, when a very slight change in one quotation or index could cause a substantial change in the Class I price.

PRICING POLICIES OF COOPERATIVES IN FLUID MILK MARKETS

Pricing formulas cannot be considered apart from price policy. Cooperative officials will be in a position to devise a satisfactory formula

for pricing fluid milk only if they have already worked out the pricing policies which the formula is to promote. The influences of these factors are not affected by the type of pricing mechanism. Also, they apply regardless of the bargaining strength of the cooperative or whether the market is regulated by a Government agency. No attempt will be made here, however, to present a theoretical analysis of how the level of milk prices in fluid markets is influenced under varying conditions.¹³

SELLING FULL SUPPLY AT TOP PRICE

When milk marketing cooperatives were first attempting to organize and to gain recognition from dealers as bargaining agents for producers, they had little need to think about long-run price policies. Their bargaining objective was to dispose of the entire supply of their members and to obtain from them the best possible returns which the immediate situation permitted. Such an objective remained economically sound so long as the returns of producers were artificially depressed due to the advantage in bargaining strength possessed by dealers in fluid markets.

The same pricing objective was in a modified form written into the Declaration of Policy of the Agricultural Marketing Agreement Act of 1937. This pricing objective of the Act was to apply until producers should achieve a level of parity prices. A conditional restriction was that the approach to the parity level should be "...at as rapid a rate as the Secretary of Agriculture deems to be in the public interest and feasible in view of the current consumptive demand..." Under the conditions of the thirties when farm prices, including prices of milk and dairy products, were depressed Congress conditionally underwrote this objective of getting the highest short-run price obtainable for dairy farmers. The parity price level established the ceiling under which this objective should apply. Milk prices above the parity level were to be established only on the basis of actual economic conditions.

Offhand it might seem that the simple policy of striving to dispose of the entire supply of milk produced by its members and securing the highest return possible at the time would be a desirable objective for any cooperative. That this is not always true is due to economic factors which over a period of time, if the price of milk is too high, may operate against the interests of producers. Long-established cooperatives have found by experience that it is not advantageous to attempt to bargain for a price beyond a certain range at any given time. This does not mean, of course, that a cooperative is not really seeking to obtain the highest possible return for its members. It is simply a matter of not seeking temporary price gains which jeopardize the members' longer run interests. Some of the major factors affecting milk prices are discussed below to emphasize the time element which must be considered in any determination of milk prices.¹⁴

¹³Those who wish to study such material are referred to: (1) Gaumnitz, E. W. and Reed, O. M. "Some Problems Involved in Establishing Milk Prices." U. S. Dept. Agr., DM-2, Marketing Information Series, 227 pp., illus. 1937; (2) Cassels, John M. "A Study of Fluid Milk Prices." 303 pp., illus. Cambridge, Harvard Univ. Press, 1937.

¹⁴For a more general discussion of the problem, see T. G. Stitts and Wm. C. Welden. "Economic Analysis of Bargaining Problems of Milk Cooperatives." Farm Credit Admin., Circ. C-104, 54 ppl April 1937.

FACTORS LIMITING THE TOP PRICE OBTAINABLE

Among the decisive factors which operate to limit the top price obtainable by a cooperative at a given time are: (1) The amount of milk which consumers in a market will buy at given prices at any particular time, (2) the amount of approved producer milk available in the milkshed to meet this demand, (3) dealers' costs of obtaining outside supplies, and (4) the bargaining strength of the cooperative.

The amounts of milk which consumers in a market will buy at given prices at any time constitute one of the primary factors in price determination. Against their appraisal of consumer demand, the representatives of the cooperative must consider the supplies of producer milk currently available for sale in the market. A classified price plan and the possession of facilities for handling surplus milk may help the cooperative to attain the maximum possible returns for its members.

Under a classified price plan, bargaining negotiations tend to be concentrated on the Class I (fluid use) price. The competition of outside milk supplies establishes rather definite upper limits for the prices of milk in other use classes. How high it is possible to increase producer returns at any time by raising the Class I price depends partly on the effect upon the consumption of fluid milk in the market. As consumption of fluid milk declines in response to a higher price, the proportion of producer milk which must go into lower-priced surplus uses increases.

The cost of obtaining milk from outside sources is another factor bearing on the top price which a cooperative may obtain at any time for its members. The higher the price established by the cooperative the more serious an effort dealers will make to go outside the cooperative for their milk. The availability of approved milk of nonmember producers and sources of supply outside the regular milkshed which are either approved or which might be approved by local health authorities, must therefore enter into immediate bargaining consideration. Even in a market where health regulations prohibit the importation of milk from farms not locally inspected, health officers might extend the area of inspection or suspend their regulations if an extremely high Class I price were established. In any case, public support for enforcement of regulations could hardly be maintained in the face of a Class I price so high as to have the effect of sharply curtailing the fluid milk supply for most of the population.

The inherent organizational strength of the cooperative, as reflected in collective bargaining negotiations with organized dealers, is also an immediate factor affecting the top price obtainable at a given time. This organizational strength depends not only on the proportion of producers in the market organized in the cooperative but also on the effectiveness of its arrangements for handling surplus milk and on other less tangible factors. For example, on the vitality of the internal organization of the cooperative will largely depend the ability and skill of the officers selected by the members to negotiate on their behalf.

SHORT AND LONG RUN SUPPLY AND DEMAND RESPONSES

The representatives of a cooperative either in collective bargaining negotiations or, in the case of regulated markets, at Government-held hearings on milk prices must consider the probable effects of different price levels on future market conditions. The greater the organizational strength of the cooperative, the more necessary it is to work out pricing policies which will help to maintain the highest degree of permanent prosperity for its members. A strong, well organized, cooperative may be able to obtain prices for its members which are above the range that would be considered in their best long-run interests.

Producers in a market, even within a short period, may make a number of responses to a change in price-cost relationships. Feeding practices are subject to quick change. Dairy farmers can step up or reduce their output by regulating the quantity and quality of feeds used. Over a slightly longer period, some dairymen are induced to buy or sell cows to adjust their operations. There also are other relatively short-run producer responses to prices which must be considered. For example the amount of milk used on the farm for fluid consumption, churning, and feeding of livestock may vary considerably with price-cost relationships. Also the normal process of herd culling may be speeded up or postponed. In some sections of the Midwest, farmers raise dual-purpose cattle which can be used for dairying or beef whichever is more advantageous. A relatively high milk price in such sections can induce a rather rapid increase in the numbers of cows used in dairy operations.

The ability of outside dairymen to transfer their milk to the market varies considerably. Some markets located in deficit milk areas¹⁵ and with high sanitary standards or restrictive inspection practices of health authorities, may be relatively immune to any immediate influx of new milk. Others, located in areas in which most milk goes to manufacturing plants, and where sanitary standards are substantially the same for fluid milk as for manufacturing milk, may have to maintain a delicate price balance to avoid too much milk coming on the market. All fluid markets must, in varying degrees, consider the possibilities of new producers coming on the market in response to an attractive price.

Consumer response to milk prices is likely to take place over a considerable period of time. In fact, it has been found difficult to measure the immediate increase or decrease in consumption following price changes. Such changes do take place over a period of time, however, and often to a marked degree. During the war years, while employment and payrolls were at high levels, and price ceilings and subsidies rendered milk prices favorable to consumers, per capita consumption rose more than 25 percent (table 6).

¹⁵ Areas in which total milk production is less than the total amount of milk consumed as milk and in the form of milk products.

Table 6. - *Per capita domestic civilian consumption of fluid milk and cream, 1935-39 and 1940 to 1947.*

Year	Per capita consumption (pounds)	Percent increase over 1940
1935-39-----	340.	-
1940-----	343.	.9
1941-----	350.	2.9
1942-----	372.	9.4
1943-----	393.	15.6
1944-----	411.	20.9
1945-----	433.	27.4
1946-----	¹ 425.	25.0

¹Preliminary.

Source: *Bureau of Agricultural Economics, The Dairy Situation, September 1947, p. 6.*

Over a longer period of time, an attempt to maintain prices out of line with economic conditions in a market will bring supply and demand responses of a more permanent nature. If prices are high dairy farmers will raise calves to maturity. They will build new barns and buy land and equipment to take care of larger herds. Local producers will face the competition not only of other dairy farmers transferring to the market but also of non-dairy farmers converting their operations to dairying.

Consumers also may in time be induced to change their actual patterns of consumption. Sales of fluid milk may be more or less permanently lost to evaporated milk or cheaper dairy products. Actually the per capita fluid milk consumption today is higher in this country than in most other countries but its place in the American diet has by no means been the same over the years. The great gains in fluid milk consumption made during the war years could be lost if fluid milk prices in any market are maintained at too high a level in relation to other foods, particularly during a period when consumer buying power was declining.

Eventually the position of the cooperative itself may be undermined by a short-sighted price policy. Large supplies of milk produced by non-members will seek the relatively attractive market. Even if this milk cannot obtain immediate approval by local health authorities, eventually these producers will meet sanitation standards and public opinion will tend to support distributors in efforts to draw upon the new, cheaper sources of supply. The cooperative then faces a double task of bargaining under conditions of an expanded milkshed with increased supplies while the unity of milk producers has been reduced. Dissatisfaction and loss of confidence on the part of members can set the stage for a process of organizational disintegration with cumulative adverse effects for producers.

WHAT IS A SATISFACTORY PRICE?

It is not easy to determine from an analysis of market data just what the price of milk should be at a given time. Competent and impartial economists working independently of each other would be unlikely to arrive at precisely the same figure. Representatives of producers and other groups in the market with a natural predilection for their special and immediate interests are likely to find themselves even farther apart in their appraisal of the price situation at any given time.

It is easier to get agreement on a range within which the price will be more or less "in line" with the dynamic forces of supply and demand in the market. That is, if the price is within that range it will appear to be performing its function of stimulating supply and demand reactions which will act to correct any tendencies toward an oversupply or shortage of milk in relation to consumer demand. A price much below or above this range would either reinforce tendencies already operating to create an oversupply or shortage, or would appear to counter them so sharply and suddenly as to be itself a factor in creating unstable marketing conditions.

If bargaining processes, or administrative determinations under regulation, are carried out with a sincere effort by all parties to maintain milk prices which are economically satisfactory, little danger arises from miscalculations in judgment which may result in a price being temporarily a little higher or lower than conditions warrant. Close and continuous observations of marketing conditions will lead to price corrections before serious harm is done to the market.

RESPONSIBILITIES OF COOPERATIVES IN FORMULA PRICING

As representatives of dairy farmers who have a most direct stake in pricing policies, dairy cooperatives usually assume a leading role in devising Class I pricing formulas and getting them adopted in fluid milk markets. The adoption of a formula for pricing Class I milk does not lessen or change in any way the responsibility of a cooperative for helping to assure a continued policy of sound pricing for the market. As mentioned earlier, a formula can be a useful instrument for adjusting prices but it is not to be assumed that it holds the solution to all pricing problems for an indefinite future period.

The cooperative, once a formula is adopted, can help to see that it is given a fair trial. Members must be thoroughly educated as to the way in which the formula works. They should know the particular logic upon which the formula rests and the factors which will result in adjustments in the Class I price. The success of the formula will in large part depend upon the confidence of all groups in its adequacy and its ability to adjust prices in a fair and reasonable manner under changing conditions. Even the best formula cannot remain in operation long unless it retains the understanding and confidence of all groups in the market.

The development and adoption of Class I pricing formulas occurred during a period of an upward movement in the general level of prices. The trend of milk prices since 1938 has been generally upward interrupted by relatively short period adjustments downward. The greatest test of formulas will come during a long period when downward price adjustments may be required by economic conditions. It is during such a period when the temptation may be strong among producers to resist necessary price adjustments and to hold the Class I price at a level which may add to market surpluses and accentuate future price difficulties.

Continuous, objective appraisal of the workings of a Class I formula by competent economists is required for its success. Changes in the formula should be sought by the cooperative if they seem required to improve its operation. If, however, the prices resulting from the operation of the formula appears to be related to conditions in the market, the cooperative must be prepared to support the continued operation of the formula, resisting changes which might reduce its future value for the market.

